



GROUNDWATER MONITORING STATUS REPORT (DRAFT)

*Daniel Chang
Monitoring and Analysis Section
Safe Drinking Water Branch*

*2018 Joint Government Water Conference(s)
July 26, 2018 (Oahu)
August 2, 2018 (Kauai)
August 7, 2018 (Maui)
August 15, 2018 (Hilo)
August 21, 2018 (Kona)*

WHY ARE WE DOING A GROUNDWATER MONITORING STATUS REPORT?

Hawaii Groundwater Protection Strategy

- **GOAL 1: Monitor and assess groundwater quality**

Objective 3: Every four years, generate a Groundwater Status Report which provides a review, analysis, and summary of groundwater monitoring data to understand contamination trends and sources of contamination. The Report shall include a list of proposed future monitoring of contaminants of concern with rationale and priorities based on severity of public health impacts.

Today's Overview

1

- Where Have We Been. A Historical Look at Groundwater Monitoring

2

- Where Are We Now. Recent/Current Groundwater Monitoring Projects (2011-2017)

3

- Proposed/Future Groundwater Monitoring Protection Activities



1

Where Have We Been.

A Historical Look at
Groundwater
Monitoring

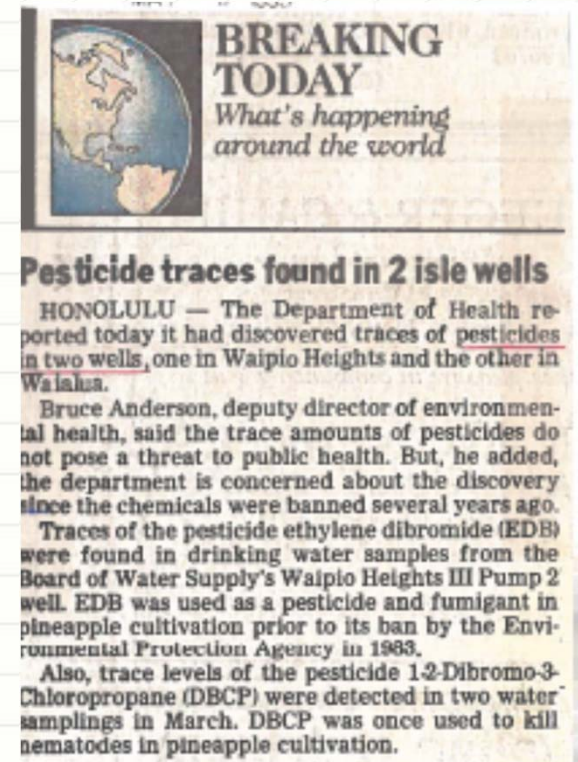
Groundwater Monitoring: Where Have We Been.

Groundwater Protection became an issue of public concern in Hawaii with the detection of pesticides used by the pineapple and sugar industries in the early 1980's.

Detection of Groundwater Contamination

- Early/Mid 1980's: Detection on DBCP, EDB, TCP
- Mid/Late-1980's: Detection of Atrazine/Degradates

The detection of other contaminants followed.



Groundwater Monitoring: Where Have We Been.

In 1986, the Hawaii State Legislature found that the establishment of a Groundwater Protection Program was a matter of compelling state interest to protect and preserve the health of the people of Hawaii. Act 220-86 provided resources to the department of health for the creation of a Groundwater Protection Program.

Program was to:

- implement groundwater strategy developed by the workgroup;
and
- initiate baseline groundwater.

Groundwater Monitoring: Where Have We Been.

Criteria for Selecting List of Chemical Parameter That Should be Monitored.

- Use of chemical in Hawaii
- Record as a groundwater contaminant
- Chemical properties (AF & RF)
- Cost and reliability of analysis
- Toxicological properties.

List of Chemical Parameter (42) That Should be Monitored.

- Acetone
- Aldicarb
- Ametryn
- Atrazine
- Benzene
- Bromacil
- Carbofuran
- Carbon Tetrachloride
- Total Chlordane
- 2,4-D
- Dalapon
- 1,3-Dibromochloropropane (DBCP)
- 1,2-Dichloropropane (1,2-D)
- Cis/Trans 1,3- Dichloropropene (1,3-D)
- Difolatan
- Diuron
- Endosulfan
- Ethylene Dibromide (EDB)
- Glyphosate
- Heptachlor
- Heptachlor Epoxide
- Hexazinone
- Methomyl
- Methyl Bromide
- Methyl Ethyl Ketone (MEK)
- Methyl Iso Butyl Ketone (MIBK)
- Mevinphos
- Namacur
- Oxamyl
- Paraquat
- Pentachlorophenol
- Perchloroethylene (PCE)
- Simazine
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloropropane (TCP)
- Trichloroethylene
- Xylene

Red indicates the target compound is an industrial chemical or waste, all others are pesticides or pesticide-related.

Groundwater Monitoring: Where Have We Been.

Implementing the Interim Groundwater Monitoring Strategy:

- Sampling began in 1987.
- Well Selection Criteria: GW use, Land use, presence of groundwater contamination in surrounding area, and geological location.
- Sample Collection
 - 1987 – 12 wells
 - 1988 – 29 wells
 - 1989 – 20 wells/13 confirmation samples
- Initial Report completed in 1991. Positives reported on Groundwater Contamination Maps.
- GW Monitoring transferred from EPO to SDW.
- Additional Monitoring Conducted for Hexazinone and MEK.
- GW Monitoring discontinued – limited to DW Monitoring.

Groundwater Monitoring: Where Have We Been.

Safe Drinking Water Monitoring Requirements (1986 SDWAA)

List of WRMC Chemical Parameters That Will be Monitored Under Safe Drinking Water Monitoring Program.

- Acetone
- Aldicarb
- Ametryn
- Atrazine
- Benzene
- Bromacil
- Carbofuran
- Carbon Tetrachloride
- Total Chlordane
- 2,4-D
- Dalapon
- 1,3-Dibromochloropropane (DBCP)
- 1,2-Dichloropropane (1,2-D)
- Cis/Trans 1,3- Dichloropropene (1,3-D)
- Difolatan
- Diuron
- Endosulfan
- Ethylene Dibromide (EDB)
- Glyphosate
- Heptachlor **
- Heptachlor Epoxide
- Hexazinone
- Methomyl
- Methyl Bromide
- Methyl Ethyl Ketone (MEK)
- Methyl Iso Butyl Ketone (MIBK)
- Mevinphos
- Nemaicur
- Oxamyl
- Paraquat
- Pentachlorophenol
- Perchloroethylene (PCE)
- Simazine
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloropropane (TCP)
- Trichloroethylene
- Xylene



2

Where Are We Now.

**Recent/Current
Groundwater
Monitoring Projects
(2011-2017)**

GROUNDWATER QUALITY MONITORING

Potential impacts to groundwater quality from various activities, such as:

Agricultural activities

- sediments
- nutrients (fertilizers)
- toxic chemicals (pesticides)

Wastewater disposal systems (cesspools, septic systems, other OSDS)

- pathogens
- nutrients
- others (such as PPCPs)

Use of Alternative Water Sources (Reuse Wastewater)

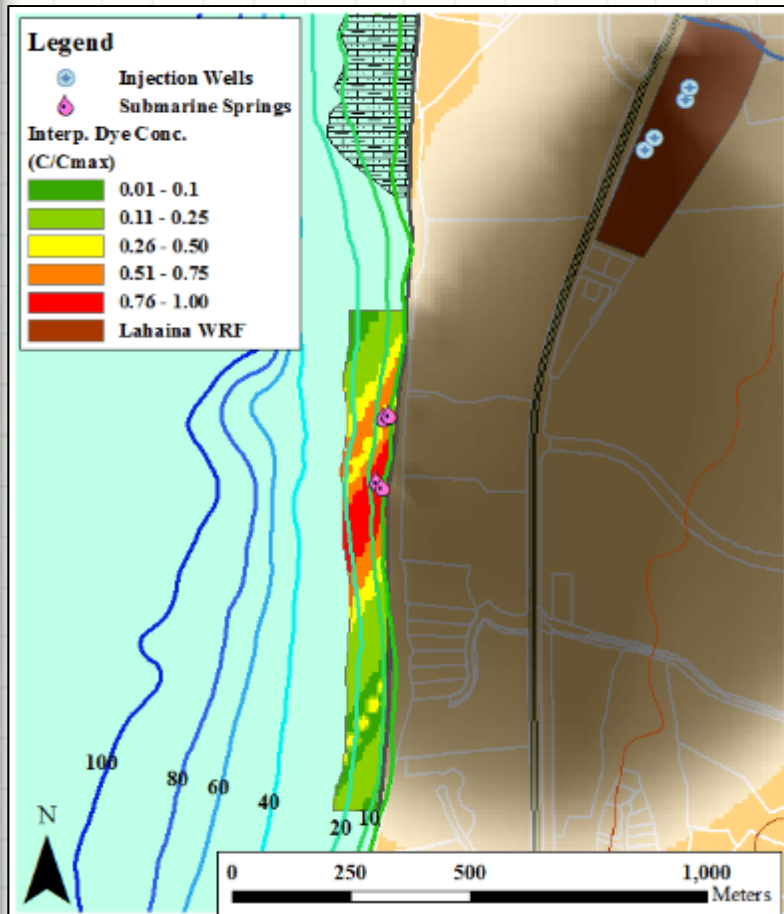
- possible contaminants of emerging concern (CEC)
- others (such as PPCPs)



Groundwater monitoring projects/activities (completed)

- **Lahaina Tracer Study (UH)**
- **Hawaiian Paradise Park Shallow GW Quality and Impacts of OSDS Study.**
- **Reclaimed Wastewater Monitoring Study (UH)**
- **Atrazine & Degradation By-Product Monitoring (2015-2017)**
- **Planning a Pesticides in Groundwater Monitoring Program (PROJECT PLANNING)**
- **Assessing the Presence of Pharmaceuticals and Personal Care Products in Water.**

Lahaina tracer study (UH)

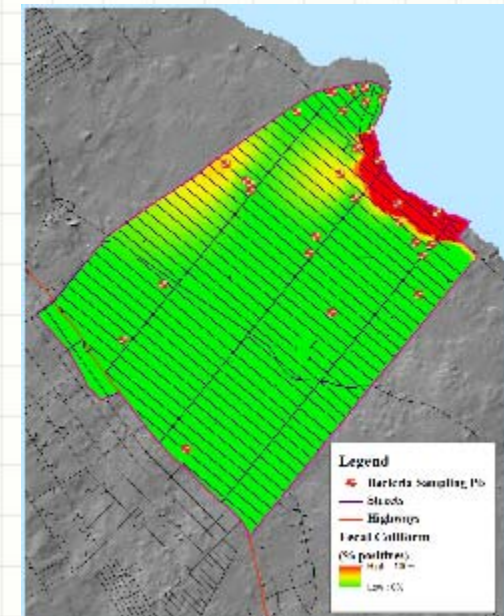
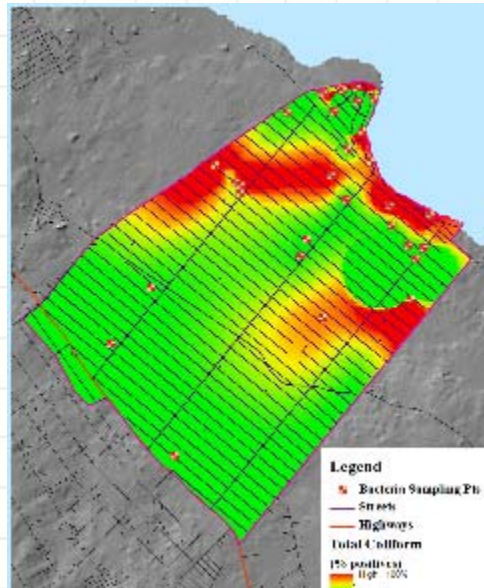


Hawaiian paradise park shallow groundwater monitoring



Figure 1. Aerial photo of Hawaiian Paradise Park taken by Hawaiian Images and Photography and Video in June 2006 (Hawaii Island Plan website: <http://www.bigislandplan.com>)

DOH investigation found 25% of domestic wells samples produced positive results for wastewater indicator bacteria.



Reclaimed Wastewater Monitoring Study (UH)



Wastewater & Reclaimed wastewater sampling for pharmaceutical & personal care products (PPCPs).



Soil sampling for PPCPs leachability testing and impacts on groundwater.



Groundwater Monitoring: Where Are We Going.

Atrazine/Degradates Sampling

- Used in Sugar Industry to control weeds.
- Detected in Hawaii groundwater since mid-1980. Last comprehensive monitoring conducted in 2003-2004.
- Determine trends and migration.

Traces of atrazine found in four Kaua'i wells

by Beth Mock

Atrazine, an herbicide used on sugar plantations which is under study by the state Department of Health, has been found in four of 17 wells sampled on Kaua'i, according to Linda Bauer, an environmental engineer with state Department of Health.

Gov. John Waihee has set a series of public information meetings on atrazine for the Big Island, Maui and O'ahu, but has not scheduled a Kaua'i meeting because the amount found in the Kaua'i wells was much lower than the amounts found on the other islands. The highest concentration in any Kaua'i well was at Kilohana Well C, which had a reading of 0.2 ppb. The highest reading in the state was 4.1 ppb.

The selective herbicide used to control broadleaf and grass weeds was found in Kaua'i wells in the following concentrations, according to Bauer:

Well	parts per billion
Anahola	0.0 ppb
Garlinghouse (Lihu'e)	0.07 ppb
LP Kealia	0.1 ppb
(third annual test, first finding)	
Kekaha	0.0 ppb
Kilohana A	0.0 ppb
Kilohana C	0.2 ppb
Kokolau intake	0.0 ppb
Koloa	0.0 ppb
Koloa C	0.0 ppb
Olokele	0.08 ppb
(third annual test, first finding)	
Paua Valley	0.0 ppb
Waipio	0.0 ppb
McBryde (Hanapepe)	0.0 ppb
McBryde (Kawapepe)	0.0 ppb
Moloka'a	0.0 ppb
Nonou	0.0 ppb
Mana shaft	0.0 ppb

The Environmental Protection Agency has suggested a no-adverse-effect level of 25 ppb with a new standard set at 3 ppb listed as a "health advisory" level. Bauer said the 3 ppb level is not enforceable since there is no adverse effect at that level, but that is the level at which the Health Department advises taking preventative measures.

She said the sugar plantations are doing most of the monitoring since they are the heaviest atrazine users on the island.

Atrazine/Degradation By-Products Monitoring Project

- Use declined from a high of over 400,000 pounds/year in 1964 to about 75,000 pound/year in 2012. (active ingredients)

Based on the latest Groundwater Contamination Maps from 2011, the following table show the number of sample locations with Atrazine and Degradation By-Products detected in groundwater, by island.

ISLAND	Atrazine	Desethyl Atrazine	Desisopropyl Atrazine	Desethyl, Desisopropyl Atrazine
Kauai	3	0	0	0
Oahu	13	13	3	3
Maui	5	6	0	1
Hawaii	32	18	3	2

Atrazine/Degradation By-Products Monitoring Project

- Many of the groundwater sources which had previous detections of atrazine or its by-products were not sampled for this project due to the sources being inactive, abandoned/sealed, or not operational at the time of sampling.
- Sources sampled generally indicates a downward trend in the level of atrazine and its by-products detected.

2015-2017 ATRAZINE/DEGRADATION BY-PRODUCTS
IN GROUNDWATER MONITORING PROJECT



DECEMBER 29, 2017
HAWAII DEPARTMENT OF HEALTH
Groundwater Protection Program - Safe Drinking Water Branch



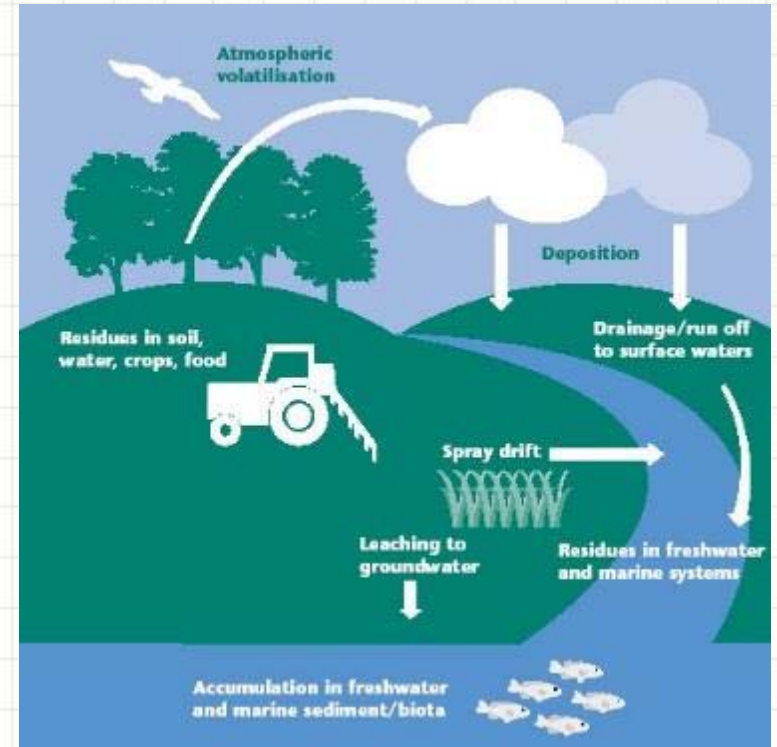
Atrazine/Degradation By-Products Monitoring Project

- **Recommendation for further actions:**
 - Resample new detections to confirm presence.
 - Sample at sources not sampled under project.
 - Sample in limited areas where atrazine still used.
 - Periodical sampling (possibly every 5-10 years) of historical detected sources to assess contaminant trends.

Groundwater Monitoring: Where Are We Going.

Pesticides in Groundwater Monitoring

- Working with Hi DOA to identify pesticides of concern for groundwater monitoring.
- Working with DOH-SLD to identify methods and capabilities to analyze samples for pesticides of groundwater concern.
- Develop phased approach to implement Pesticides in Groundwater Monitoring Program. Conduct monitoring program in three (3) phases.



Groundwater Monitoring: Where Are We Going.

Pesticides in Groundwater Monitoring

- Selection criteria includes:
 - use of pesticide in Hawaii;
 - is there a groundwater advisory;
 - is it a Registered Use Pesticide (RUP);
 - monitored in drinking water; and
 - is there an approved analytical method.

Groundwater Monitoring: Where Are We Going.

PESTICIDES IN GROUNDWATER MONITORING PROGRAM

ACTIVE INGREDIENT	REGULATORY STATUS	GROUNDWATER ADVISORY	RESTRICTED USE PESTICIDE (RUP)	USE	DRINKING WATER	MCL/HA	EPA METHOD	MONITORING PHASE
2,4-D		Yes	No		Yes		515.3	1
Acetochlor		Yes	No				535	3
Alachlor		Yes	Yes		Yes		508.1 507	1
Aldicarb	Under cancellation	Yes	Yes				531.1	1
Atrazine		Yes	Yes		Yes		508.1 507	1
Bentazon		Yes	No				515.3	2
Bromacil		Yes	Yes(S)				507	2
Carbofuran	Cancelled	Yes	Yes				531.1	1
Chlorothalonil		Yes	No				508.1	2
Clopralid		Yes	No					3
Dacthal (DCPA)	Undergoing cancellation	Yes	No				515.3	2
DBCP	Cancelled	N/A			Yes		504.1	1
Dimethenamid		Yes	No					3
Hexazinone		Yes	Yes(S)				507	2
Imidacloprid		Yes	No					3
Metalaxyl		Yes	No					3
Metsulfuron methyl		No	No					3
Metolachlor		Yes	Yes		Unreg		508.1 507	1
Metribuzin		Yes	No		Unreg		508.1 507	1
Norflurazon		Yes	No				507	2
Picloram		Yes	Yes		Yes		515.3	1
Simazine		Yes	Yes(S)		Yes		508.1 507	1
Tebuthiuron		Yes	No				507	2
Terbacil		Yes	No				507	2
Thiamethoxam		Yes	No					3
Triclopyr		Yes	No					3

Groundwater Monitoring: Where Are We Going.

Fludioxonil		Yes	No					3
Fluopicolide		No	No					3
Imazaquin		Yes	No					3
Chlorantraniliprole		Yes	Yes					3
Quinclorac	Not licensed in HI	Yes	Yes					3
Cyantraniliprole	Pending full GW review	Yes	N/A					3
Penflufen		Yes	No					3

PHASE I: PESTICIDES ON EXISTING DRINKING WATER MONITORING LIST

2,4-D	Metolachlor
Alachlor	Metribuzin
Atrazine/Metabolites	Picloram
DBCP	Simazine

PHASE 2: PESTICIDES ON EXISTING DRINKING WATER ANALYTICAL METHODS

Bentazon	Hexazinone
Bromacil	Norflurazon
Chlorothalonil	Tebuthiuron
Dacthal	Terbacil

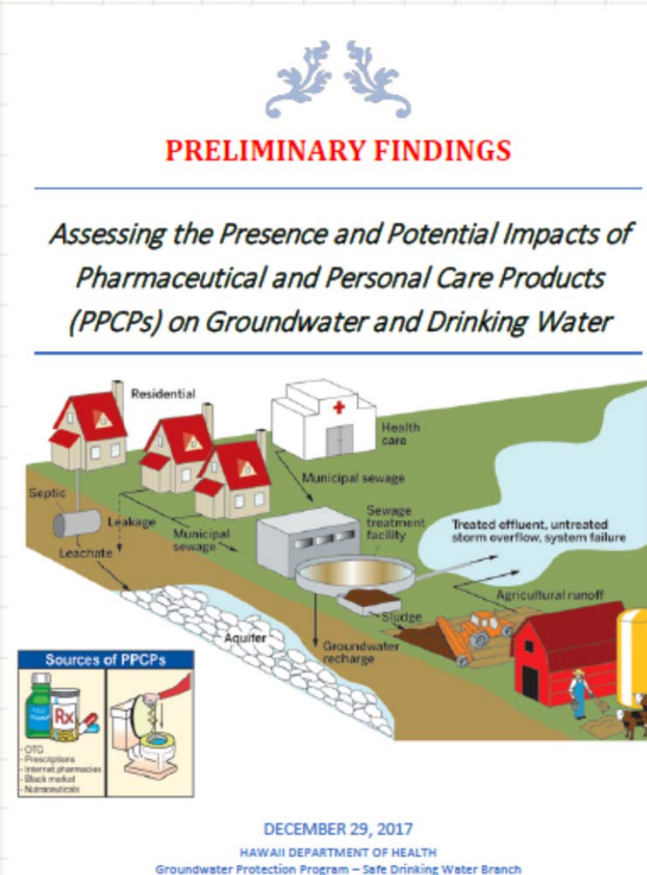
PHASE 3: PESTICIDES REQUIRING APPROVED ANALYTICAL METHODS

Acetochlor	Metsulfuron methyl	Chlorantraniliprole
Clopralid	Triclopyr	Quinclorac
Dimethenamid	Fludioxonil	Cyantraniliprole
Imidacloprid	Fluopicolide	Penflufen
Metalaxyl	Imazaquin	

DW/GW Monitoring Projects

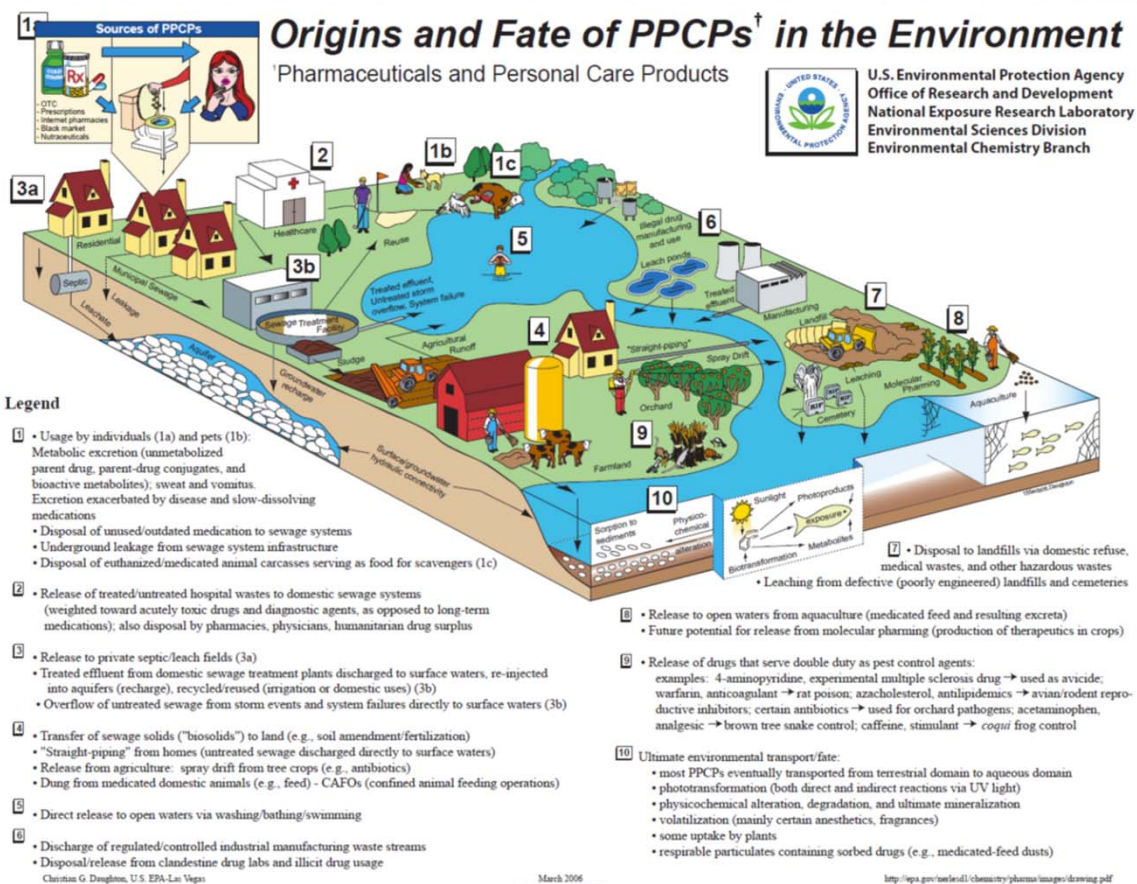
Reuse Water Monitoring

- Greater demand for water.
- Identify of potential alternative sources
- Environmental & Health Risks



Identify the sources of wastewater and reclaimed water

- Wastewater Treatment Plants
- Stormwater
- On-site Waste Disposal Systems
- Other wastewater discharges



PPCPs Monitoring Study

LC-MS-MS ENDOCRINE DISRUPTORS (POSITIVE MODE - SPE)

1,7-Dimethylxanthine	Acetaminophen	Albuterol
Amoxicillin (semi-quantitative)	Androstenedione	Atenolol
Atrazine	Bezafibrate	Bromacil
Caffeine	Carbadox	Carbamazepine
Carisoprodol	Chloridazon	Chlorotoluron
Cimetidine	Ciprofloxacin - Cipro	Cotinine
Cyanazine	DACT	DEA
DEET	Dehydronifedipine	DIA
Diazepam	Dilantin	Diltiazem
Diuron	Erythromycin	Flumequine
Fluoxetine	Isoproturon	Ketoprofen
Ketorolac	Lidocaine	Lincomycin
Linuron	Lopressor	Meclofenamic Acid
Meprobamate	Metazachlor	Metolachlor
Nifedipine	Norethisterone	Oxolinic acid
Pentoxifylline	Phenazone	Primidone
Progesterone	Propazine	Quinoline
Simazine	Sulfachloropyridazine	Sulfadiazine
Sulfadimethoxine	Sulfamerazine	Sulfamethazine
Sulfamethizole	Sulfamethoxazole	Sulfathiazole
TCEP	TCCP	TDCPP
Testosterone	Theobromine	Theophylline
Trimethoprim		

PPCPs Monitoring Study

LC-MS-MS ENDOCRINE DISRUPTORS (NEGATIVE MODE - SPE)

2,4-D	4-nonylphenol - semi quantitative	4-tert-octylphenol
Acesulfame-K	Bendroflumethiazide	BPA
Butalbital	Butylparaben	Chloramphenicol
Clofibric Acid	Diclofenac	Estradiol
Estrone	Ethinyl Estradiol - 17 alha	Ethylparaben
Gemfibrozil	Ibuprofen	Iohexal
Iopromide	Isobutylparaben	Lipitor (Atorvastain)
Methylparaben	Naproxen	Propylparaben
Salicylic Acid	Sucralose	Triclocarban
Triclosan	Warfarin	

PPCPs Monitoring Study

Wastewater Reclamation Facilities of Wastewater Treatment Plants

RAW Influent Wastewater

Schofield WWTP (Oahu)

Wahiawa WWTP (Oahu)

Pukalani WWTP (Maui)

Waimea WWTP (Kauai)

R-1 Grade/Quality Reuse Water

Schofield WWTP (Oahu)

Wahiawa WWTP (Oahu)

Honouliuli WWRF (Oahu)

Laie WWTP (Oahu)

Lihue WWTP (Kauai)

Poipu WWTP (Kauai)

Grove Farm Lihue-Puhi WWTP (Kauai)

Pukalani WWTP (Maui)

Lahaina WWTP (Maui)

Waikoloa WWRF (Hawaii)

Kihei WWTP (Maui)

PPCPs Monitoring Study

Wastewater Reclamation Facilities of Wastewater Treatment Plants

R-2 Grade/Quality Reuse Water

Waimea WWTP (Kauai)

RO Quality Effluent Water

Honouliuli WWTP (Oahu)

Groundwater

Pukalani Golf Course Well (Maui)

Omaopio-Esty Well (Maui)

Kipapa Acres Well (Oahu)

PPCPs Monitoring Study

Analytes Found in all raw wastewater influent samples were:

1,7-Dimethylxanthine	Acetaminophen
Caffeine	Cotinine
DEET	Theophylline
Acesulfame-K	Ibuprofen
Naproxen	Propylparaben
Sucralose	

Analytes Found in > 75% of raw wastewater influent samples or at least once (1) at each WWRF/WWTP:

Amoxicillin (semi-quantitative)	Androstenedione
Atenolol	Cimetidine
Diazepam	Lidocaine
Meprobamate	Quinoline
Sulfamethoxazole	TCEP
Testosterone	Theobromine
Trimethoprim	Gemfibrozil
Methylparaben	Triclosan

PPCPs Monitoring Study

ANALYTES (found at all treated wastewater sources sampled)

Sucralose

ANALYTES (found at all treated wastewater sources sampled, except Honouliuli RO)

1,7-Dimethylxanthine	Acetaminophen	Caffeine
Cotinine	Lidocaine	TCEP
TCPP	Theophylline	Acesulfame-K

ANALYTES (found at a significant number of treated wastewater sources sampled)

Amoxicillin	Atenolol	Carbamazepine
Carisoprodol	DACT	DEET
Dilantin	Diltiazem	Diuron
Erythromycin	Lopressor	Meclofenamic Acid
Meprobamate	Primidone	Quinodone
Sulfamethoxazole	TDCPP	Theobromine
Trimethoprim	4-nonylphenol	Gemfibrozil

PPCPs Monitoring Study

OTHER ANALYTES OF INTEREST (found in multiple treated wastewater sources)

Albuterol	Ketorolac	4-tert-octylphenol
BPA	Diclofenac	Estrone
Ibuprofen	Iohexal	Iopromide
Naproxen	Salicylic Acid	Triclocarban
Triclosan		

Several analytes were detected in the three samples:

Pukalani:	Amoxicillin, Chloridazon, Sulfamethoxazole, Sulfathiazole, 4-nonylphenol, and Acesulfame-K
Omaopio-Esty:	Amoxicillin, Bromacil, Chloridazon, Sulfathiazole, and 4-nonylphenol
Kipapa Acres:	Cimetidine, DACT (Diamino-chloro-triazine), and Sucralose

PPCPs Monitoring Study

Data Observations

- (1) Some analytes were found in the raw wastewater influent but not in the treated effluent – possibility that analytes are treated/removed by the wastewater treatment process.
- (2) Some analytes were found in the treated effluent but not in the raw wastewater influent – there is a possibility that those analytes were masked by the chromatographic peaks of other analytes (of high concentration) but detected in the treated effluent after treatment/removal of the higher concentration analytes.
- (3) Reverse osmosis appears to be an effective method of removing PPCPs from wastewater as the first round sample did not detect any analytes and the second round sample only detected three (3) analytes. This is compared with the R-1 water from the same treatment facility that showed the detection of 58 analytes.

Data Issues

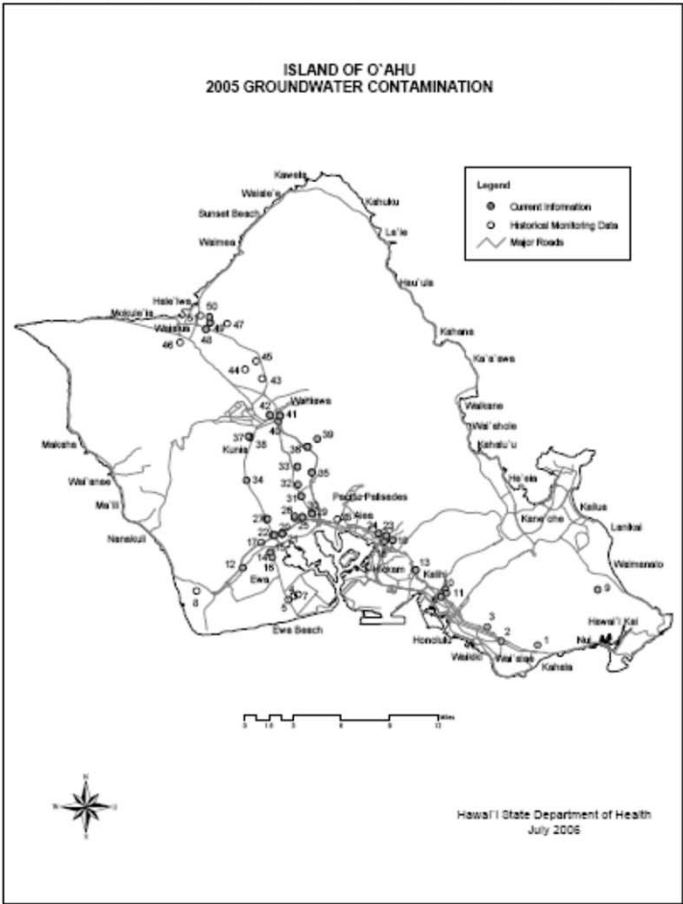
Are there other factors that may have impacted the monitoring project and do these factors affect the presence and levels of PPCPs in raw wastewater influent and treated wastewater effluent? Possible concerns may be associated with wastewater flow/time of sampling (more flow may equate to more dilution or possibly increase analyte levels), treatment processes (how does the process affect the treatment/removal of the analyte), or possibly population demographics (differing population factors such as age, race, health issues, others may affect the type and quantities of PPCPs that would be used in a particular geographical area).

DW Compliance Monitoring (Groundwater Systems/Sources)

- Over 450 drinking water well sources
- Analyze for regulated contaminants.

List of WRMC Chemical Parameters That Will be Monitored Under Safe Drinking Water Monitoring Program.

- Acetone
- Aldicarb
- Ametryn
- Atrazine
- Benzene
- Bromacil
- Carbofuran
- Carbon Tetrachloride
- Total Chlordane
- 2,4-D
- Dalapon
- 1,3-Dibromochloropropane (DBCP)
- 1,2-Dichloropropane (1,2-D)
- Cis/Trans 1,3- Dichloropropene (1,3-D)
- Difolatan
- Diuron
- Endosulfan
- Ethylene Dibromide (EDB)
- Glyphosate
- Heptachlor **
- Heptachlor Epoxide
- Hexazinone
- Methomyl
- Methyl Bromide
- Methyl Ethyl Ketone (MEK)
- Methyl Iso Butyl Ketone (MIBK)
- Mevinphos
- Nemaicur
- Oxamyl
- Paraquat
- Pentachlorophenol
- Perchloroethylene (PCE)
- Simazine
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloropropane (TCP)
- Trichloroethylene
- Xylene



Groundwater Contamination Maps and Viewer



The Groundwater Contamination Viewer is available at: <https://eha-cloud.doh.hawaii.gov>.

Groundwater Contamination Viewer (2013-present)



The Groundwater Contamination Viewer is available at: <https://eha-cloud.doh.hawaii.gov>.



3

Proposed/Future Groundwater Monitoring Activities



The Hawaii Department of Health is now faced with several issues related to water protection including:

- The **elimination and upgrade of cesspools** (Hawaii State Legislature mandated that all cesspools in the State be replaced by 2050 - Act 125, 2017). To meet this requirement DOH is actively involved with planning efforts through the development and implementation of a Hawaii Cesspool Strategy. The implementation of the Hawaii Cesspool Strategy will include interagency and stakeholders coordination, development of funding alternatives, and public education and outreach efforts;
- Due to the increasing need for water and declining high quality groundwater resources available, the State is now looking at alternative sources of water, including the reuse of treated wastewater. The DOH supports and advocates the use of treated wastewater providing that public health and water resources are not compromised (**by potential contaminants, such as PPCPs**); and
- As technology changes and evolves, new and emerging chemical compounds (**such as pesticides**) are being developed and used. As such, we must be cognizant of these potential emerging contaminants of concern and their potential impact to our water resources and public health.

Future monitoring projects

- **Ambient Groundwater Quality Monitoring of non-drinking water sources.**
- **Monitoring of non-drinking water contaminants (including new and emerging contaminants).**
- **GW Quality Impacts of OSDS Study.**
- **Priority Watersheds – Groundwater Monitoring.**
- **Monitoring for climate change and sustainability.**

Contaminants to be Monitored:

- Pesticides
- Pharmaceuticals and Personal Care Products
- Water Quality Parameters Associated with OSDS; and
- Chlorides

Groundwater Monitoring: Where Are We Going.

Pesticides in Groundwater Monitoring

- Working with Hi DOA and DOH-SLD to develop and implement a Pesticides in Groundwater Monitoring Program.
- Implement phased approach to monitor for pesticides of groundwater concern. Monitoring to be developed/implemented in three (3) phases. **Phase 1 and 2 to begin in Fall 2018.**

Groundwater Monitoring: Where Are We Going.

PESTICIDES IN GROUNDWATER MONITORING PROGRAM

ACTIVE INGREDIENT	REGULATORY STATUS	GROUNDWATER ADVISORY	RESTRICTED USE PESTICIDE (RUP)	USE	DRINKING WATER	MCL/HA	EPA METHOD	MONITORING PHASE
2,4-D		Yes	No		Yes		515.3	1
Acetochlor		Yes	No				535	3
Alachlor		Yes	Yes		Yes		508.1 507	1
Aldicarb	Under cancellation	Yes	Yes				531.1	1
Atrazine		Yes	Yes		Yes		508.1 507	1
Bentazon		Yes	No				515.3	2
Bromacil		Yes	Yes(S)				507	2
Carbofuran	Cancelled	Yes	Yes				531.1	1
Chlorothalonil		Yes	No				508.1	2
Clopralid		Yes	No					3
Dacthal (DCPA)	Undergoing cancellation	Yes	No				515.3	2
DBCP	Cancelled	N/A			Yes		504.1	1
Dimethenamid		Yes	No					3
Hexazinone		Yes	Yes(S)				507	2
Imidacloprid		Yes	No					3
Metalaxyl		Yes	No					3
Metsulfuron methyl		No	No					3
Metolachlor		Yes	Yes		Unreg		508.1 507	1
Metribuzin		Yes	No		Unreg		508.1 507	1
Norflurazon		Yes	No				507	2
Picloram		Yes	Yes		Yes		515.3	1
Simazine		Yes	Yes(S)		Yes		508.1 507	1
Tebuthiuron		Yes	No				507	2
Terbacil		Yes	No				507	2
Thiamethoxam		Yes	No					3
Triclopyr		Yes	No					3

Groundwater Monitoring: Where Are We Going.

Fludioxonil		Yes	No					3
Fluopicolide		No	No					3
Imazaquin		Yes	No					3
Chlorantraniliprole		Yes	Yes					3
Quinclorac	Not licensed in HI	Yes	Yes					3
Cyantraniliprole	Pending full GW review	Yes	N/A					3
Penflufen		Yes	No					3

PHASE I: PESTICIDES ON EXISTING DRINKING WATER MONITORING LIST

2,4-D	Metolachlor
Alachlor	Metribuzin
Atrazine/Metabolites	Picloram
DBCP	Simazine

PHASE 2: PESTICIDES ON EXISTING DRINKING WATER ANALYTICAL METHODS

Bentazon	Hexazinone
Bromacil	Norflurazon
Chlorothalonil	Tebuthiuron
Dacthal	Terbacil

PHASE 3: PESTICIDES REQUIRING APPROVED ANALYTICAL METHODS

Acetochlor	Metsulfuron methyl	Chlorantraniliprole
Clopralid	Triclopyr	Quinclorac
Dimethenamid	Fludioxonil	Cyantraniliprole
Imidacloprid	Fluopicolide	Penflufen
Metalaxyl	Imazaquin	

DW/GW Monitoring Projects

PPCP – Further Action(s)

Additional Monitoring Needs and Resources.

- Conduct follow-up sampling to confirm results;
- Evaluate impacts of PPCPs on groundwater resources;
- Utilize data to develop and implement a PPCPs in Water Monitoring Program with focus on PPCPs and indicators detected in raw influent and R-1 effluent.

DW/GW Monitoring Projects

PPCP – Further Action(s)

- **Criteria for areas where reuse wastewater should not be used;**
- **Conduct leaching model studies of identified and selected PPCPs to determine leachability to groundwater; and**
- **Assessment of monitoring results to determine the impacts of using R-1 water over drinking water/groundwater resources.**

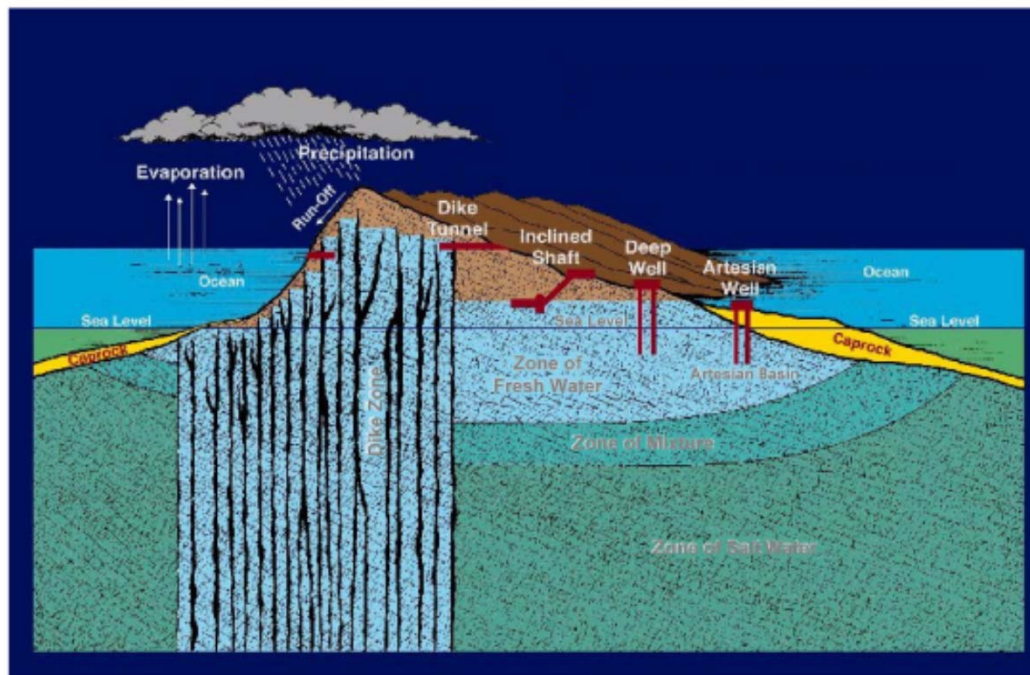
Water Quality Impact of On-Site Wastewater Disposal Systems (OSDS)

PROJECT

- Monitor groundwater resources in areas with high or large densities of OSDS to determine impacts to water quality.
 - Nutrients
 - PPCPs
 - Possible Pathogens

Groundwater Monitoring: Where Are We Going.

- **Monitoring of Chlorides in Groundwater**



- Associated Quantity/Quality Issues
- Salt Water Intrusion
- UIC Boundaries
- New DW Sources
- Others

Thank you!

Hawaii Department of Health
Safe Drinking Water Branch
Uluakupu Building 4
2385 Waimano Home Road, Suite 110
Pearl City, Hawaii 96782-1400

Phone: (808) 586-4258

Email: SDWB@doh.hawaii.gov

Website: <http://health.hawaii.gov/water/>